

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

1
Ag84F
p. 3

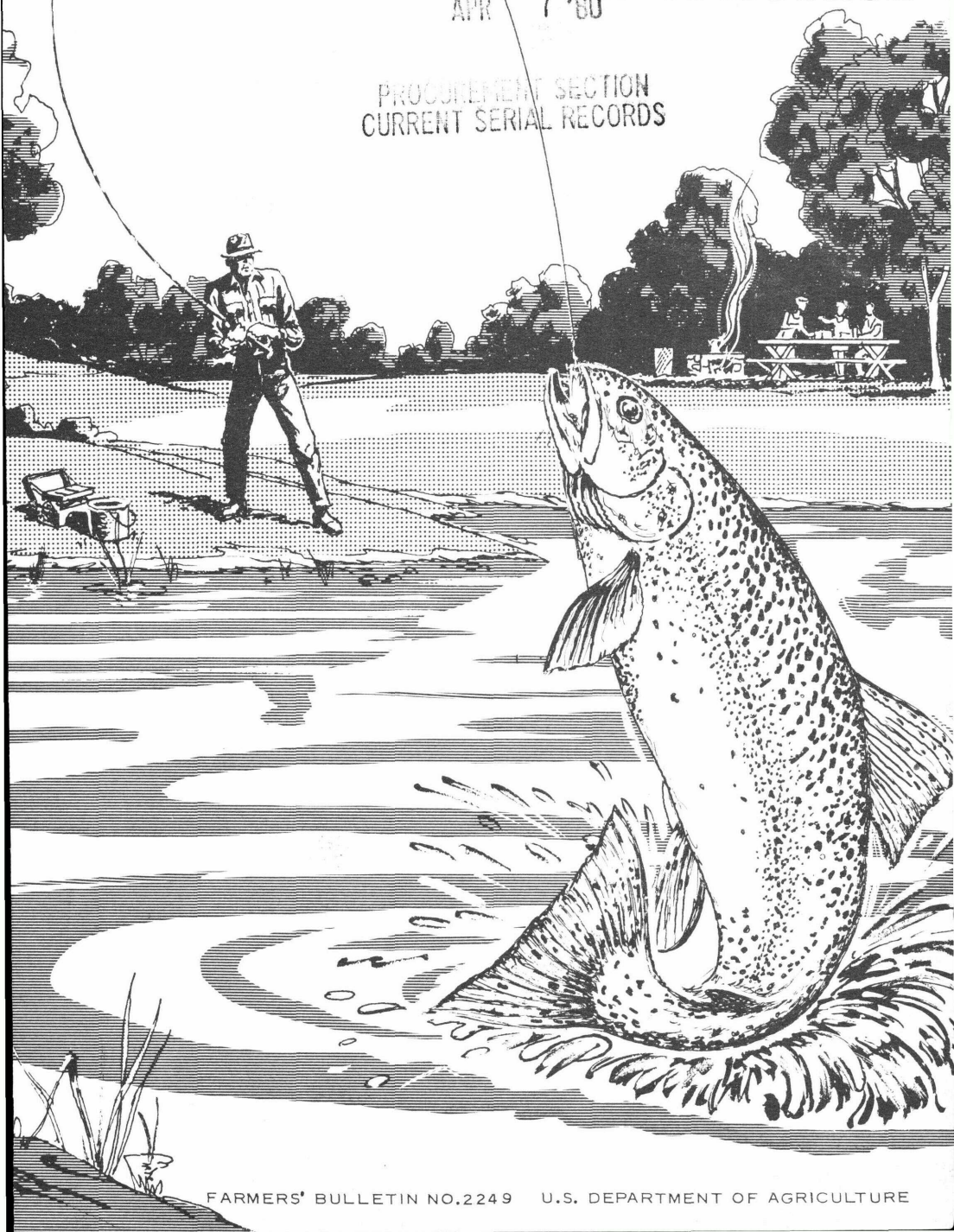
DC BRANCH
U.S.D.A.
NAT'L AGRIC LIBRARY
RECEIVED

TROUT PONDS

for recreation

APR 7 '80

PROCUREMENT SECTION
CURRENT SERIAL RECORDS



CONTENTS

	Page
Geographical range	1
Water temperature	1
Summer	1
Winter	2
Stocking the pond	2
Kinds of trout	3
Number to stock	3
Restocking	4
Where to get trout	4
How to stock	5
Supplemental feeding	5
Harvesting the fish crop	5
Removing unwanted fish	6
Selecting the pond site	6
Planning the pond	7
Size	7
Depth	7
Landscaping	8
Pond inlet	9
Pond outlet	9
Earthfill dam	10
Draining the pond	10
Protection from livestock	10
Water quality	11
Waterweed control	12
Fish die-offs	12
Points to remember	13
Fish and water laws	13

This publication supersedes Farmers' Bulletin 2154, Trout in Farm and Ranch Ponds.

Washington, D.C.

Issued November 1971

For sale by the Superintendent of Documents, U.S. Government Printing Office
 Washington, D.C. 20402 - Price 15 cents
 STOCK NUMBER 0100-1533

TROUT PONDS

for recreation

By L. DEAN MARRIAGE, ADREY E. BORELL (retired), and PAUL M. SCHEFFER (retired), *biologists*, Soil Conservation Service

Trout fishing in privately owned ponds is becoming more and more important to farm, ranch, and suburban families. A trout pond not only provides good fishing but can also become the central point for many other forms of recreation—boating, swimming, sun bathing, ice skating, picnicking, and nature study. Some farmers and ranchers are increasing their income by providing trout fishing and related outdoor recreation services for a fee.¹

If you have a trout pond, you, your family, and friends can look forward to many pleasurable hours of outdoor recreation.

You may need assistance from a biologist, a soil specialist, and an engineer in locating, designing, and building a good pond. Your local soil and water conservation district can arrange such assistance from the Soil Conservation Service (SCS). Or you may wish to contact private consultants.

Geographical Range

Ponds above 5,000 feet in the West are usually cold enough for trout. In the fog belt of the Pacific coast, in the northern tier of states, in the Appalachians, and in New

England, trout thrive in ponds at lower elevations. Ponds at any elevation or in any latitude, fed by cold springs or cold wells, may be suitable.

Water Temperature

Trout can live in water between 33° and 75° F. but they make their most rapid growth in water of 50° to 65° F. Not only do trout make their fastest growth within this temperature range but they are less susceptible to parasites and diseases. It is not likely that you will be able to keep the water temperature in your pond within this range all year unless you have a source of constant-temperature water from a spring or well.

If the water in your pond is too warm for trout, you may want to stock bass, bluegills, catfish, or other warm-water fish. Suggestions are given for managing warm-water ponds in USDA Farmers' Bulletin 2250, Warm-Water Fishponds. Copies are available from your local soil conservation district office, county agent, and the U.S. Department of Agriculture.

Summer

In summer, the surface water of a pond is coldest just before sunrise. If the water temperature at this time

¹ For more information, see USDA Leaflet 552, Trout Farming, Could Trout Farming Be Profitable for You?



Trout ponds are most likely to succeed in shaded areas. Ponds, at any elevation or in any latitude, fed by cold springs or cold-water wells may be suitable for trout.

is not more than 70° F., 6 inches below the surface, it is not likely to rise more than 5 to 10 degrees during the day. Trout die if the water temperature reaches 86° F. Trout may survive a few hours' exposure to high surface temperatures each day but they usually seek cooler, deeper waters.

You can lower the water temperature and raise the oxygen level by increasing the inflow of fresh, cool water and releasing the warm water through a surface outlet gate.

Summer growth of trout is slower in the cold water of mountain ponds than in the warmer water (50° to 65° F.) at the lower elevations. Since the coldest water is at the pond bottom during summer months, the outflow from mountain ponds should be through a bottom-water outlet. This results in more favorable trout growth.

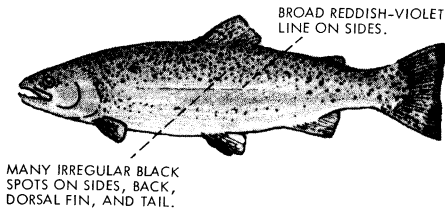
Winter

In areas where ponds are covered with ice during winter, the water temperature will be 33° F. just below the ice and about 39° F. on the bottom. Water is most dense and therefore heaviest at 39° F. Water warmer or colder becomes less dense and tends to layer above water of 39° F. Little, if any, fish growth takes place at these low temperatures. The only way you can raise the water temperature enough to benefit trout is to add a supply of water warmer than 50° F.

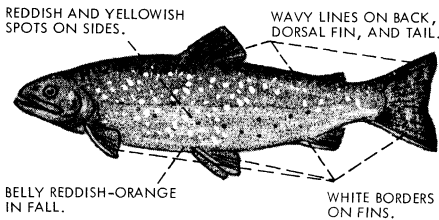
Stocking the Pond

To manage your trout pond best, you will need to know something about the kinds of trout you can stock and how suitable they are for your pond.

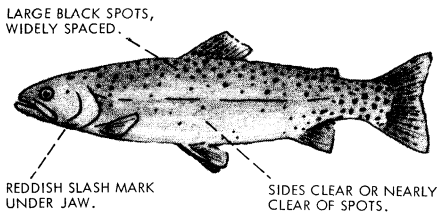
RAINBOW



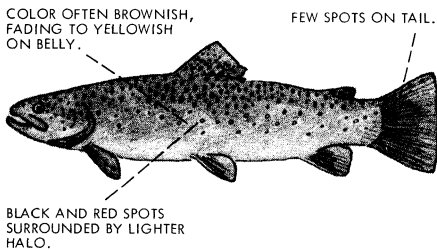
BROOK



CUTTHROAT



BROWN



Each kind of trout has special markings that identify it.

Kinds of trout

The rainbow trout is the most common choice for stocking ponds. It thrives under a wide range of conditions and grows fast. Rainbows are more widely available from hatcheries than are other kinds of trout.

The brook trout is favored in parts of the East although rainbows do as well and are widely available. Brook trout are a little easier to catch than rainbows and sometimes spawn in springs or trickles that are not suitable to the rainbow. Brook trout are available from some hatcheries in the West and from most hatcheries in the East.

In some sections of the country, both rainbow and brook trout are stocked in the same pond for variety. Whether you stock them singly or together is a matter of choice.

The cutthroat trout has been little used in ponds and is not widely available from hatcheries.

The brown trout is longer lived and grows larger in many ponds but it is more cannibalistic and harder to catch than are other kinds of trout. Brown trout are not recommended for stocking ponds.

Don't stock other kinds of fish with trout—they compete with the trout for oxygen and food. If your pond has 50 pounds of other kinds of fish, it will likely have 50 pounds less of trout.

If there are other fish in the pond, drain it or use chemicals to kill all fish before stocking with trout (see section, Removing Unwanted Fish, p. 6).

Number to stock

The number of trout a pond will support depends on its surface area

(not volume), water quality, and size of the fish. The carrying capacity of a pond is limited and is measured in pounds of fish rather than in numbers. Therefore, for any given level of management, a pond will support more little fish than big fish.

Ponds of average fertility usually produce enough natural food to support about 100 pounds of trout per surface acre. On the basis of production records in the West, spring stocking a 1-acre pond with 500 2- to 4-inch fingerlings will give you 7- or 8-inch (4 ounces) trout the first year. Stocking at half that rate in the fall should give you 10-inch (8 ounces) trout.

In the East, the standard fall stocking rate is 600 3- to 4-inch fingerlings per acre. This stocking rate has resulted in 8-ounce trout the first year.

In general, 2- to 4-inch fingerlings are more likely to survive to pan size than are 1- to 2-inch ones.

Whether your management goal is more small fish or fewer large ones, fingerlings stocked in the fall benefit from favorable growing conditions early the following spring. As a result, they reach pan size sooner.

If winterkill or unavailability of fingerlings in the fall is a problem, you may be limited to spring stocking.

Restocking

A pond stocked in fall will contain many small but usable trout the first year. If you fish these small fish lightly, you should catch some trout weighing $1\frac{3}{4}$ to 2 pounds during the second year.

Waiting another year or two for a 2-pound trout to grow larger is not worthwhile. Trout grow slowly after they reach this size, and their

death rate is high. Also, they seldom spawn in ponds. For these reasons, it is best to fish your pond hard and restock it with 4- to 5-inch fingerlings every year or two.

Some pond owners prefer to drain their pond or use chemicals to kill all the fish at the end of the second season (see section, Removing Unwanted Fish, p. 6). This prevents the few remaining large trout from eating any of the newly stocked fingerlings. Cannibalism is not considered a major problem, however, if the pond is fished hard and the population reduced so that there is plenty of food.

To improve management and to determine the best restocking rate for your pond, keep records of previous stocking rates and of the growth, harvest, and survival of your trout. Someone in your local SCS office can help you set up a simple record-keeping system and interpret the records.

Where to get trout

In most cooler parts of the United States, you can buy trout for stocking from private fish hatcheries or from trout farmers. With air transportation and other modern shipping methods, trout can be sent quickly and safely to almost any location. Hatchery personnel will make shipping arrangements or tell you how to transport your fish.

The more trout you order from a private hatchery, the lower the price will be per thousand. You may be able to pool your order with other pond owners in your area to get a lower price.

Your state fish and game agency or the local Soil Conservation Service office can give you a list of hatcheries that sell trout for stocking.

In some states, the Bureau of

Sport Fisheries and Wildlife of the U.S. Department of the Interior or the state fish and game agency provides fingerling trout for stocking ponds. But some type of agreement regarding public access may be required.

How to stock

Avoid stocking trout in water above 65° F.

Because trout are sensitive to sudden changes in temperature, oxygen, carbon dioxide, and alkalinity or acidity, you should never dump the fish directly into your pond from a shipping container.

Pond water should be added slowly to the water in the shipping container until it is within 6° F. of the temperature of the pond water. An easy way to do this is to pour out about half of the water from the container. Then place the container in the pond and pour pond water slowly into it. When it is full, pour out about half the mixture and repeat the process twice more. This should take only 15 or 20 minutes.

If the trout show signs of distress such as turning on their sides, delay further mixing until they act normal.



Before releasing trout fingerlings, pond water should be added slowly to the water in the shipping container until it is within 6° F. of the temperature of the pond.

ally. After mixing is completed, pour the fingerlings gently into the pond.

Supplemental Feeding

You can increase the carrying capacity of your trout pond and get steadier trout growth by supplementing natural foods with commercially prepared ones. This means that you can produce 1,000 to 2,000 pounds of trout per acre annually, which is 10 to 20 times more pounds of trout, by supplemental feeding.

In theory, you could stock as many fish as you want if you give them enough food. In practice, this doesn't work. Crowded fish are easy prey to diseases and parasites.

If you stock a 1-acre pond with 2,000 2- to 4-inch fingerlings and provide enough supplemental feed to grow 1,000 pounds of trout, you will get 1/2-pound trout at the end of the first year. It takes about 1 pound of feed to produce a 1/2-pound trout under favorable growing conditions.

Young trout may need to be fed several times a day for fast growth. But don't overfeed. Feed only what the fish will clean up promptly. If any food remains 15 minutes after feeding, it probably will not be eaten. Decomposing food uses oxygen and may cause loss of fish.

If the water in your pond is above 65° F., it is not safe to do supplemental feeding.

Dry, pelleted trout feeds, available from commercial trout feed dealers, are easy to use. Dealers furnish a detailed feeding schedule based on fish size and water temperature.

Harvesting the Fish Crop

With good management and no supplemental feeding, your pond should reach its carrying capacity

in pounds of fish within a year after stocking. During the second year, trout make little growth unless the pond is fished regularly. Remember, each fish you take out allows the remaining ones to gain weight faster.

To get the greatest return in numbers of pan-size trout and in pounds of fish, start fishing as soon as the trout are 6 to 8 inches long. This will be about 6 to 10 months after you stock your pond with fingerlings.

Early in the second year, your trout should be 12 to 14 inches long and weigh about 1 pound. From then on, increase in length will be slower but the fish will weigh more.

Only a small percentage of the trout you stock will live more than 2 years. At the end of 3 years, just a few large trout will remain and their total weight will be far below the carrying capacity of your pond.

Large trout are fun to catch but growing big ones is not good pond management. Make every effort to remove them.

Pan-size trout in ponds usually are easy to catch. You may have the most fun fishing with flies, spinners, or other artificial lures. If you don't have this equipment or casting skill, you can catch trout with a bamboo pole and bait. Anglemorms are a favorite bait. Grasshoppers, crickets, and salmon eggs are good too.

You are most likely to catch trout at times when they are feeding. In warm weather, they feed mostly in the mornings and evenings. In early spring or late fall when the water is cold, they usually feed during the middle of a sunny day. Winter fishing through a hole in the ice is good sport.

Here is a good rule—any time you see trout rising to the surface is a good time to go fishing. If trout

aren't rising and you still want to fish, try fishing deep.

Don't be afraid to catch your trout. Remember, you can restock.

If you clean trout promptly after catching, freeze them in water. They will retain their fresh taste for several months. Make sure the fish are completely encased in ice.

Check regulations in your state on size, bag limit, season, and methods of take that apply to private fishponds.

Removing Unwanted Fish

It is a good idea to keep wild fish out of your pond. They compete for oxygen and food and increase the chances of diseases. Screening the inlet pipe or running the water through a filter helps to keep them out.

If you have unwanted fish in your pond, you may need to drain it before restocking. Or you may want to use a chemical to kill all the fish if you are unable to drain the pond.

Before using chemicals, contact your state fish and game agency for recommended kinds and amounts and for regulations that may apply.

Selecting the Pond Site

In helping you select a suitable site for your pond, SCS specialists give attention to these important site requirements:

Dependable source of good quality water. To maintain safe pond-water temperature and adequate oxygen, your pond needs enough inflow to keep it full all year. But make certain the inflow is free of pollutants and has an acidity-alkalinity range that is safe for trout (see section, *Water Quality*, p. 11).

Soil that holds water without excessive seepage. Some seepage losses

can be corrected by compacting the soil on the pond bottom or by sealing the bottom with clay or other materials.

A location that is free from danger of heavy runoff or flooding. If these requirements are met, a site for your trout pond is a matter of choice. You may want your pond to be part of your home beautification plan and family outdoor recreation area. Or you may want the pond in a remote section of your property.

Planning the Pond

A pond built and managed for trout usually produces more fish than a multipurpose pond. With some changes, however, ponds built for stockwater or irrigation-water storage or for other purposes can provide good trout fishing. Increasing water depth by making the dam 3 or 4 feet higher may be all that is needed. Or the outlet or inlet may need redesigning for better water control.

Size

You can raise trout successfully in a pond of almost any size. Ponds

smaller than one-third of a surface acre generally will not support enough fish for food or sport without supplemental feeding. You can have some excellent trout fishing, however, in a pond as small as one-tenth of a surface acre if you follow a regular feeding schedule.

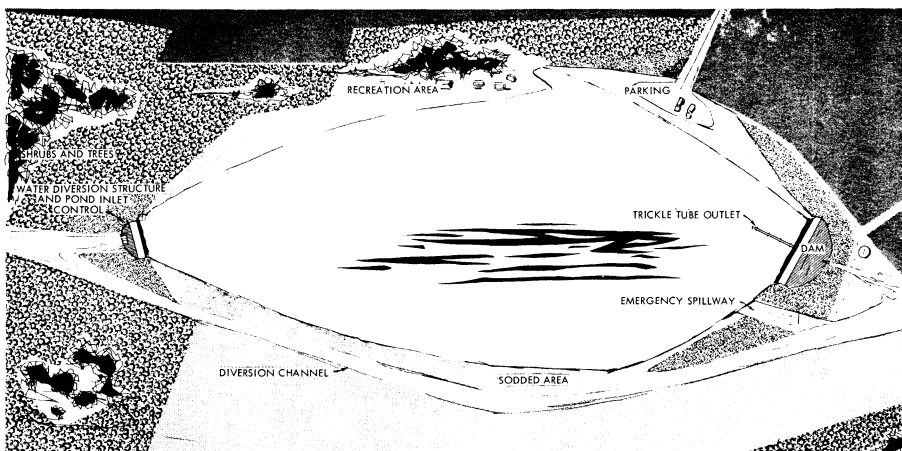
A trout pond of one-half to 1 surface acre is an ideal size for a family. A pond of 1 to 3 acres will provide plenty of fishing for you and your neighbors and friends. Well-designed trout ponds of 5, 10, and even 20 acres are not uncommon.

If a large water area is needed, such as for fishing clubs, it is usually best to build several ponds of 1 to 5 acres each. Several small ponds are easier to manage and produce more pounds of fish per surface acre than one or two large ones.

Water supply is often the factor that limits pond size. Plan the size of your pond for the average—not the maximum—supply of water.

Depth

The depth of a trout pond depends largely on water supply and



A plan showing pond construction and suggested location of outdoor recreation facilities.

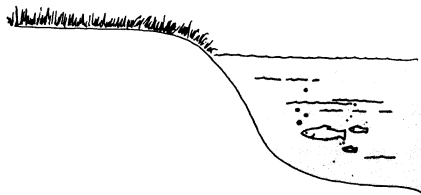
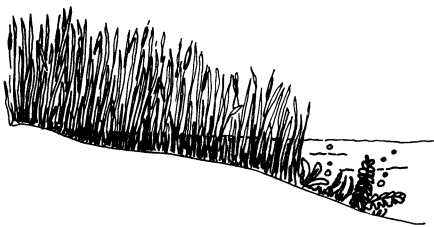
climate. But you need to think about some of the uses you plan to make of your pond.

As a general rule, a depth of 3 or 4 feet is about right for trout ponds supplied by a constant flow of water.

Some irrigation reservoirs used for short-period storage are suited for trout if at least 3 feet of water is left at all times to maintain the fish.

If your pond is filled only during rainy seasons, you will need a water depth of at least 10 to 12 feet over one-fourth or more of the pond area. This depth is particularly important in areas where trout die-off has occurred under ice cover or during hot weather.

The shore of your pond should slope as abruptly as possible to a 3-foot water depth. A gently sloping shoreline results in shallow-water areas, which encourage growth of weeds and mosquitoes. Also a shallow shoreline is hard to fish from and more fish are lost to wading birds.



A gently sloping shore results in shallow-water areas, which encourage growth of weeds and mosquitoes (top). A shore that slopes abruptly gives less trouble and provides a pleasant bank to fish from (bottom).

Landscaping

With a little planning, you can make your trout pond and the recreation area around it one of the most attractive spots on your property.

Your first step is to sketch a plan showing the pond site and the location of other outdoor recreation facilities such as barbeque pit, picnic tables, sandy wading beach, boat dock, playground areas, and car parking lot. Once these are located, make a plan to provide shade trees for the picnic area, shrubs for screening the comfort station, and grass for play areas.

Landscaping may be only a matter of taking out some trees to open up areas for recreation. But you may want to save a particularly attractive tree or two around the pond, making certain you leave plenty of space for casting.

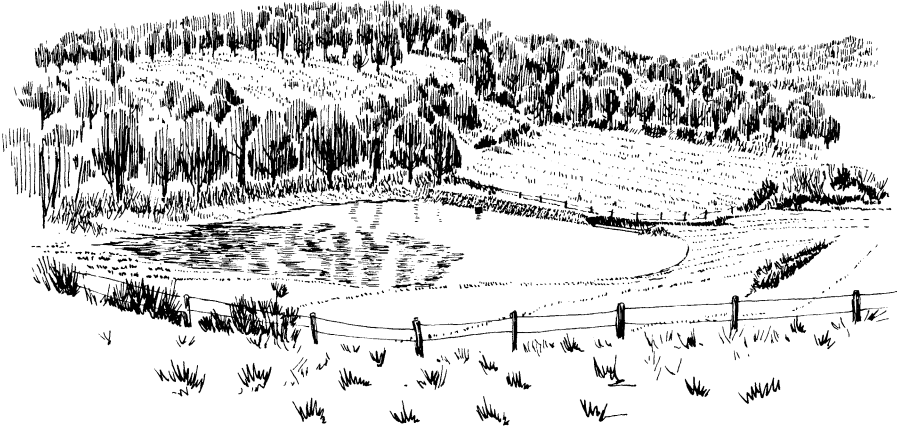
Trees, stumps, brush, cattails, and debris should be removed from the pond site.

Seed an area at least 30 feet back from the waterline to sod-forming grasses to help suppress weeds and woody plants. Sod-forming grasses should also be planted and maintained on the dam and in the emergency spillway.

You will find that an irregularly shaped pond usually has a more pleasing appearance than a circular or square-cornered pond.

Site beautification is especially important if your pond can be seen from your home or from the highway. Mixed clumps of evergreen and deciduous trees bordered by shrubs make a pleasing pattern and provide cover for wildlife, including songbirds. You may want to plant some deciduous trees and shrubs so that their fall colors reflect to full advantage on the pond surface.

Don't plant willows or other de-



With careful landscape planning, your trout pond can be one of the most attractive spots on your property.

ciduous trees within 30 feet of the pond. They will interfere with fishing and shed leaves into the water. Decomposing leaves stain the water and use oxygen.

Pond inlet

If the water for your pond is supplied by runoff or by a stream that may have heavy flood flows, you should have controls to divert silt-laden or surplus water.

Pond outlet

Most well-designed trout ponds have two outlets—a trickle tube for normal flows and an emergency spillway for flood flows. If you can control the water flowing into your pond, however, you won't need an emergency spillway.

TRICKLE TUBE

A trickle tube is usually enclosed in a vertical riser pipe and connects with the outlet pipe that runs through the bottom of the dam. The height of the trickle tube determines

the level of the pond water. Few trout, if any, escape through this tube and it is not possible for fish to enter the pond through it.

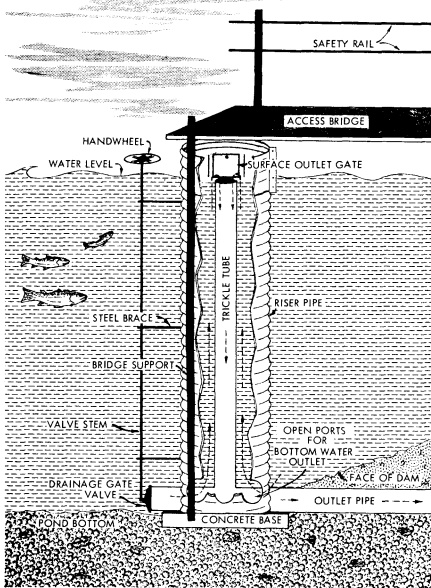
By placing the trickle tube inside a riser pipe, you can direct the pond outflow through either the surface outlet gate or the bottom outlet pipe, depending on whether you want to discharge warm or cool water.

With the surface outlet gate closed, water from the pond enters open ports at the bottom of the riser. It then rises to the top of the trickle tube where it is discharged through the outlet pipe. With the surface outlet gate open, water flows directly into the top of the trickle tube.

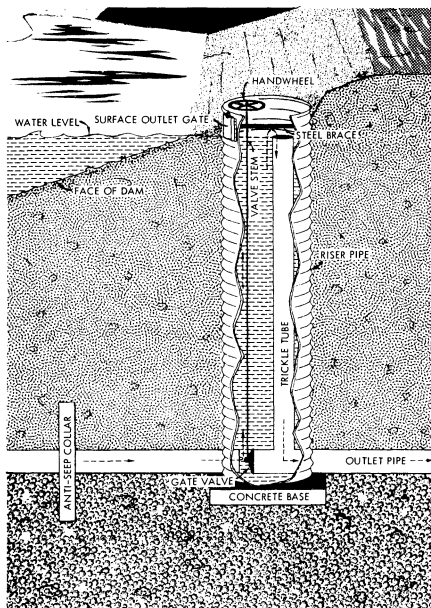
You can place the trickle tube at the upstream toe of the dam or within the earthfill of the dam. The latter is better if the trickle tube needs protection from ice.

EMERGENCY SPILLWAY

An emergency spillway is installed at one end of the dam. If you build the spillway wider than is needed to handle floodwater, the outflow



Trickle tube designed to allow outflow from either the surface or bottom of the pond. Direction of flow is shown through bottom outlet pipe with surface outlet gate closed.



If the trickle tube needs protection from ice, it should be installed within the earthfill dam. Direction of flow is shown through bottom outlet pipe with surface outlet gate closed.

water will be shallower and the current slower. This reduces trout loss during storm periods because trout have less tendency to swim into 3 or 4 inches of water than into deeper water. Never screen the emergency spillway. Screened spillways clog with debris and endanger the dam.

Earthfill dam

Sound design and construction of the earthfill dam prevents leakage, frequent repair, and loss of the pond.

You can get engineering help from the Soil Conservation Service through your local soil conservation district. Or you can consult a private engineer. Either can help you design and build a dam suited to your soil, topography, and water supply.

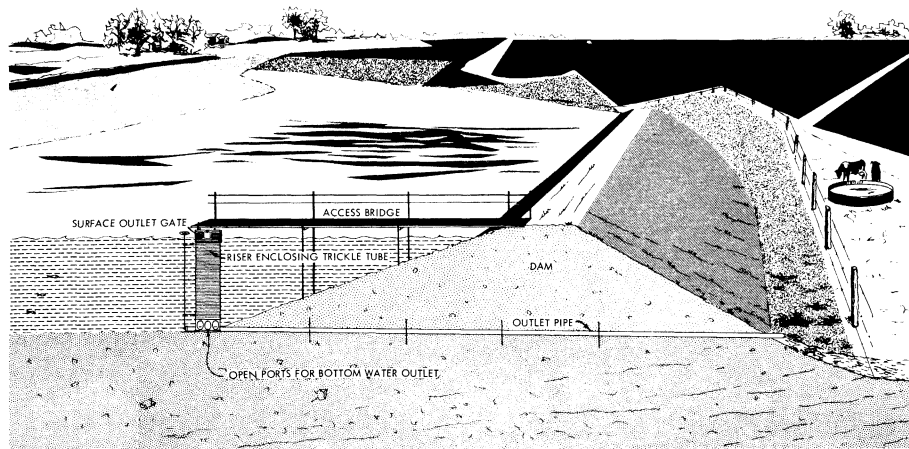
Draining the Pond

Some states require that all impounded waters have some means of complete drainage. Whether or not the law requires a drainage outlet, it is a good idea to have one. You can release foul water from the pond bottom and lower the water level from time to time to repair structures and control weeds. Also, draining the pond may be the easiest way to harvest a large number of trout or remove unwanted fish.

The best way to drain your pond is through a gate valve located at the junction of the outlet pipe and the trickle tube.

Protection from Livestock

As a rule, a pond should be fenced if livestock are present. Trampling can damage earthfill dams and pond shorelines. Also livestock may keep the water muddy. Ponds used for livestock water provide poor fishing and usually are too unattractive and



Cross section of an earthfill dam showing surface and bottom water outlet control system.

unsanitary for recreation use. If you need stock water, you can pipe it to a tank outside the fenced pond.

Water Quality

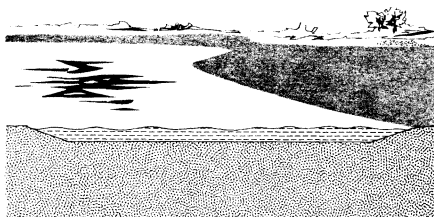
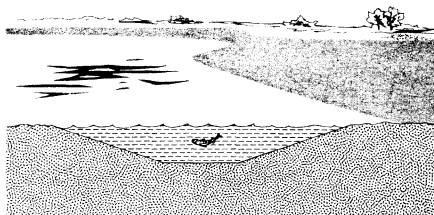
Good-quality water is important for successful trout-pond management. The quality of pond water is subject to constant physical and chemical changes that may affect trout. Some important changes result from seasonal or daily variances in air temperature. Other significant changes result from decomposition of organic matter in the water, sudden rainstorms, pollutants, and even shade from a summer cloud cover.

Understanding the water-quality needs of trout will help you manage your pond better.

Water flowing into a trout pond must have an oxygen content of at least 5 parts per million (ppm). It must be free of sewage, sediment, harmful gases, and other pollutants. An acidity-alkalinity range of pH 6 to 8 is preferable, although trout may survive a range as low as pH 4.5 to as high as 10 if the change is not too abrupt.

Sewage can cause low oxygen, slime growth, and a foul odor in your trout pond. Sewage also can be a hazard to human health. Sediment can destroy a pond by filling it. Minute amounts of most insecticides can kill the trout.

Water from springs or wells frequently is low in oxygen and may



More trout escape through the swiftly moving deeper water of a narrow spillway (top) than through the more shallow water of a wide spillway (bottom).

contain carbon dioxide or other harmful gases. Running the water over rocks or baffles removes carbon dioxide and some other gases. This exposes the water to air and adds oxygen. You should never let water containing hydrogen sulfide or other harmful gases flow into your pond.

Bottom waters frequently contain harmful gases and too little oxygen for fish. You can improve this by draining the foul water from the pond bottom regularly and by providing for some inflow of fresh water. Removal of bottom water is particularly important in winter and during hot summer months when fish die-off is most likely to occur.

Waterweed Control

Without control, waterweeds may become abundant and interfere with fishing and other recreation.

When dead waterweeds decompose, they use oxygen. This is one of the main causes of summer die-off and winterkill of trout.

The best way to avoid problems with waterweeds is to prevent or control their growth. This is not an easy job, and you may find that control methods are limited.

Preventing and controlling waterweeds begins with design and construction of a pond. You will find that the shallower the water, the greater the waterweed growth. Therefore, build your pond deep enough and make the shore slope abruptly. Also fill in shallow areas and marshy spots to help prevent waterweeds from getting started. (See section, Planning the Pond, p. 7).

Established waterweeds in cold-water ponds can be controlled by mowing or pulling by hand.

Fish Die-offs

Fish die-offs most commonly are caused by lack of oxygen in the water. They may occur any time of the year but are most common during summer and winter.

In summer, rapid decomposition of dead waterweeds may use up the oxygen after 2 or 3 days of dark, cloudy weather. The same thing can happen if the weather is hot and still. If you notice trout coming to the surface in early morning and gasping for air, turn fresh water into the pond immediately.

Some pond owners add oxygen and lower the water temperature by pumping water from the pond and returning it through sprinkler heads. Also, you can buy special aerators for this purpose.

If ice and snow cover the pond for a month or more, winterkill of trout may result from lack of oxygen or from toxic gases. You can reduce or eliminate winterkill by—

Reducing aquatic vegetation before winter ice forms. Vegetation decomposing under the ice uses up oxygen and releases harmful gases.

Providing some inflow of water during winter. This is the surest way to provide oxygen. If you have a pump, run it a few hours each week to break the ice loose from the shoreline. The pipe from the pump must enter the water under the ice.

Draining gas-laden bottom waters from the pond. If you have a constant flow of water from a bottom outlet pipe, foul waters will not accumulate. Bottom water containing toxic gases is dark colored and smells strongly of hydrogen sulfide (rotten-egg smell) as it is discharged from the pond.

Points to Remember

1. Build the pond that fits your needs and that is right for your soil, water supply, and climate.

2. A good small pond gives more satisfaction than an inferior large pond.

3. Have as little water as possible that is less than 3 feet deep.

4. Prevent or control water-weeds.

5. Run no more water through the pond than is necessary to maintain correct water level, proper temperature, and adequate oxygen.

6. Be sure your pond is free of other fish before stocking trout.

7. Restock in the fall at least every second year for maximum production.

8. Keep the bank and shore free of tall weeds and brush so that fishing will be a pleasure.

9. Avoid using insecticides on the watershed or near the pond. Most insecticides, even in minute

concentrations, kill fish. Do not wash spray equipment at the pond.

10. Start fishing as soon as your trout reach pan size; don't let them die of old age.

11. Improve management by keeping a record of stocking rate, growth, harvest, and survival of your trout.

12. Add fresh water immediately if you see many fish swimming near the pond's surface. It is usually a sign they need oxygen. This may happen on hot still days, on cloudy days, or if the water level is too low.

13. Plan for a drainpipe in your pond. It permits easy draining for fish removal and water-quality control.

14. Provide some inflow of water during winter, if possible. This is the surest way to prevent winterkill.

FISH AND WATER LAWS

Laws and regulations for private fishponds vary from state to state. Check with your state fish and game agency about those that may affect your operation. Also, state laws on water storage vary greatly. Your state engineer or water authority can advise you on this.

